

## Facilitating Innovation in Dairy

*A private sector model to transform the dairy sub sector in Ethiopia*



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*October 2015*

## **Executive Summary**

*Market-led development is now dominating the thoughts and practices of several stakeholders in Ethiopia. Although the understanding of the concept varies, the changing economic context of the country demands agribusiness actors to adapt a different approach than the traditional model of development. Components like technology transfer are part of the traditional model and put greater emphasis on increasing production and productivity, and little to no attention to market demands. Value chain approaches to private sector development are considered an example of market-led development initiatives.*

*However, there are not enough incentives for knowledge institutions to participate in such value chain initiatives. The agricultural innovation system framework discussed in this paper provides a better way of combining these two important forces of development. The Ethiopia Sustainable Agribusiness Incubator (ESAI), a pilot project financially supported by USAID and Irish Aid and implemented by Precise Consult International, analyzes the relevancy of this new framework to the current booming economic climate in Ethiopia. Particularly, the agribusiness incubator puts emphasis on project engagements that facilitate innovation in the dairy subsector.*

*This paper covers the relevant theoretical discourse of agricultural innovation in the dairy sub sector. The methodological approaches used by the agribusiness incubator project was used as an example to demonstrate the agricultural innovation system framework. The support provided to 15 private companies involved in the dairy subsector and the impact observed by the project, provides lessons on the value chain approaches to private sector development. The analysis of the case study dissected in this paper finally leads to the development of an innovation framework that helped run the agribusiness incubator project.*

**Agricultural Innovation System:** *Inclusive perspective to organize knowledge, businesses and policies in agriculture*

Agricultural research and development are closely linked aspects of humanity. Depending on the extent of its complementarity, agricultural R&D heavily affects peoples' livelihood and will continue to do so in many ways. Before the birth of modern science, our ancestors experimented with agriculture to domesticate plants and animal species and to develop local agricultural systems that worked best for them. Indigenous knowledge of rural Ethiopians has been passed on from generation to generation in many forms. Each time, adding new knowledge that attributes to the introduction of new practices and values to their indigenous stock. This trend was severely challenged after the industrial revolution in Europe introduced labor saving devices, heavy

manufacturing machines, medical technologies, IT facilities, new livestock breeds, new crop varieties, etc.

At that time, things were changing so rapidly that the modern system received more attention by policy makers than indigenous knowledge systems, particularly indigenous knowledge systems in agriculture became less relevant. The rapid jump from the indigenous system to the modern system showed tremendous increment in production and productivity. However, the systemic gap between the local and modern system created a huge disconnect in the humanity development process. Issues related to equity, poverty, environmental degradation and climate change were instead placed at the center of policy dialogue and academic rhetoric towards development approaches. The gap between smallholder farmers and business enterprises, and technologies in research centers juxtaposed to the accelerating level of poverty in the next villages are just a few of the gaps caused by the transition from indigenous systems to modern ones. Not to mention the huge schism between supply chain actors and processing industries, and the blurred focus in research versus the actual demands of the market.

There are three distinct institutional frameworks of research and development that help tackle the above-mentioned challenges. The old, yet most influential model of agricultural research and development, especially in Africa, is called the Transfer of Technology (ToT) model. The ToT model provides a foundation for the establishment of the National Agricultural Research System (NARS). The NARS is an institutional form created to coordinate the national research work of specialized agricultural research organizations and universities throughout many places in Africa. The ToT model was grounded on the theory of adoption and diffusion of innovations. This profound model considers research/universities as a sole source of knowledge in agriculture and studies why and how people come to adopt or not adopt new agricultural innovations that comes from research (Leeuwis & Ban, 2004). Policy makers who are supportive of this model are greatly interested to direct government investments to the establishment of new research centers, laboratories and pays emphasis on the high-level training of

researchers. They have very clear goal of improving production and productivity using modern technologies. It presumes that researchers generate knowledge, which is then directed to farmers through extension workers, and this knowledge is believed to overcome the challenges of farmers who live and work in a very diverse environment.

However, there are several critics to it for being unable to meet the demands of farmers and ecological diversities, for paying little or no attention to the knowledge of farmers; most importantly for being inadequate to facilitate agricultural innovation in a complex socio-economic set up. The linkage between researchers, extension workers and farmers is of course very strong but it is often in a top down fashion and without having enough feedback loops in the system. While in complex systems the players in the economy are not only smallholder farmers. They are plenty and their interests and missions are diverse, markets are unpredictable but also with tremendous opportunities, policies and regulations are too many, often dynamically changing in response to global political and economic situations. The conventional ToT model, which is primarily a play field of researchers, extension workers and smallholder farmers have therefore very little value to bring innovation and development in such contexts.

The Agricultural Knowledge and Information System (AKIS) perspective, which is the second institutional framework for research and development, came in to picture in the early 90's to address the limitations of the ToT model. AKIS pays attention to the process of technology development and adaptation in a participatory way, with the key actors including: research, farmers and extension workers. AKIS makes a strong argument that improving the communications and linkages of the key actors in the system and recognizing all actors as a source of knowledge of diverse types improves innovation performance. This is a paradigm shift that also demanded policy reorientation from a focus on creation of research infrastructures to investments in the software, to improve communications and linkages between the key players in research and development. Following the popularization of AKIS, several participatory methodologies such as PRA, RRA, PTD, PID, RAAKS, Farmers Field School and others, came in to picture. Nevertheless, actors in the AKIS model are still restricted to farmers, researches, educators and

extension workers. The huge force of the private sector actors who moves and shakes the economy are not considered as principal players, sometimes even completely forgotten in the interactions. It is again less promising to consider AKIS as a framework of analysis in complex situations where there is an economic boom and market forces are driving the process. This leads to the development of the third and most recent institutional framework, called, Agricultural Innovation Systems (AIS). The AIS perspective is an advanced institutional set up for research and development, which aims to overcome the limitations of the two models discussed above.

AIS and AKIS share lots of values and complementarities. For example in AIS, as in AKIS, the innovation process does not always start with research and the knowledge coming from research does not necessarily create new practice or values. Rather, it underscores that it is only within the innovation system that knowledge and information from various sources interact to bring new phenomena desired by the system actors. It embraces not only the science supplier but also the totality and interaction of actors involved in the innovation. In other words, the sources of knowledge in the AIS and AKIS models are not only scientific institutions but also, the private sector players, farmers and other development workers in the system. Here knowledge is not only referring to the explicit/codified and scientific artifacts from research and universities but also to the tacit knowledge from other actors, which provides well analyzed and context specific information on every day phenomenon, policy issues, local and international market demands, local systems, environmental conditions and the like.

The main distinction between the AKIS and AIS perspectives is however the fact that AIS addresses a broader spectrum of actors and pays greater attention to the private sector. Unlike to the ToT model and AKIS, which are preoccupied with only technological innovations, AIS pays additional attention to institutional change, not strictly in the sense of organizations but changes in the commonly set habits and practices that greatly influence the innovation processes. Innovation System therefore (IS) refers to the network of organizations, enterprises and individuals focused on bringing new products, new processes and new forms of organization into economic use, together

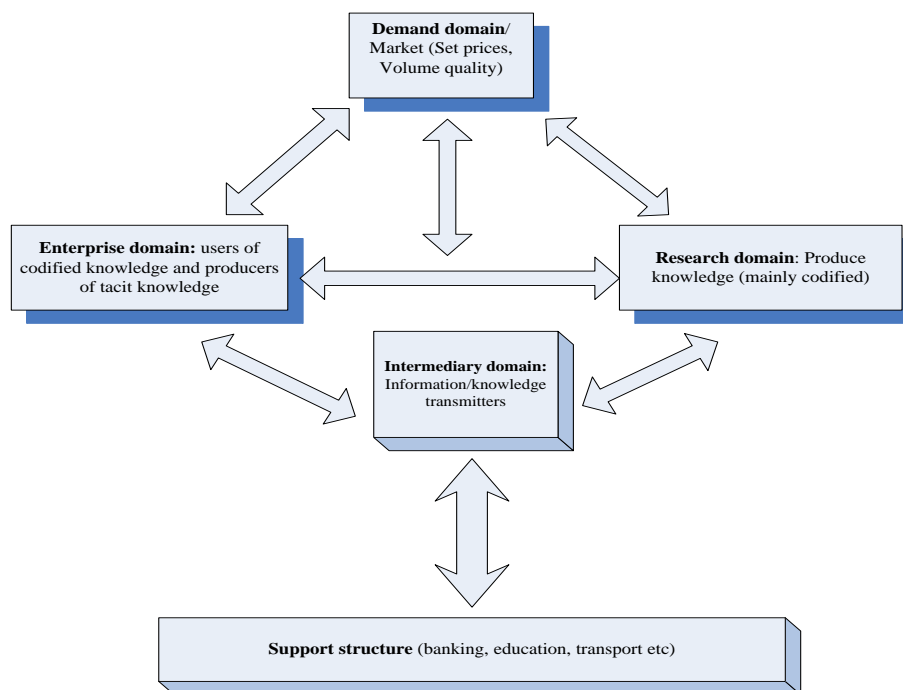
with the institutions and policies that affect the systems' behavior and performance (Hall *et al.*, 2006a; Rajalahti *et al.*, 2008). Again the term *innovation* is understood in AIS differently from the conventional model of ToT, which equates innovation just with technologies of all kinds from research. Innovation in AIS do not necessarily refer to the creation of new knowledge/technology but to the introduction of new processes, organizational forms, technologies, methods, policies, etc. to a socio-economic system to create new values that benefits the constituents.

As described above, innovation is a "system" perspective because it happens to take place as a result of interactions of various actors and factors. *Innovation* never happens in closed doors like some of the *inventions* created in a research laboratory. For an *invention* to be turned in to innovation has to be successfully entered in to the socio economic system to bring new values. The process of entrance is not rather an easy and straightforward phenomena but it demands exploration of relevant policies, institutional and regulatory issues, understanding the system, identification of the most relevant players in the market and the scientific knowledge domain, creating effective partnerships and networks. A successful performance in this regard is known as innovation. The fact that the IS perspective deals with "new" standards makes it also different from other development paradigms. The "new" nevertheless contains elements that we do not comprehend and about which we are uncertain (Rosenberg & Kline, 1986). One has to innovate to deal with the uncertain circumstances to turn them into scenarios that are better understood. However the term *new* does not necessarily mean the creation of something novel to the entire world, but also refers to the adaptation of a new technology, processes, institutional arrangement and the like; which adds value and makes socio-economic sense to the local context.

In AIS, the link between knowledge created by the scientific domain and non-scientific source - with the market demands is expected to be very strong. In the conventional model, often knowledge created in research and universities are not adequately responding to the market demands. They are rather more of academic with fewer relevancies to the practical world of farmers and enterprises. Aligning the knowledge

creation efforts with market demands is therefore the key changes the AIS framework is advocating for.

The appropriate mix of the diverse knowledge bodies is therefor the basis of innovation (making new things happen in a complex situations) and this requires a process, which envisages systematic learning, creative facilitation skills, risk taking attitudes, flexible management and adaptive behavior. This could not take place in one go as a linear process, but it is characterized by the interplay of various actors and complex interactions that may yield intended and unintended impacts. The involved actors may explore opportunities to make benefits out of the seemingly messy socio-economic set-up, if the right linkages and partnerships for the right purpose are taking place at the right time. What is "right" is nevertheless a subjective phenomenon that can be explored, constructed and negotiated by the constituents in a collective learning mode.



**Figure 1 Innovation systems model (adapted from Hall 2006)**

## 2. Study Methodology

Ethiopia Sustainable Agribusiness Incubator (ESAI) is a project implemented by Precise Consult International (PCI) in 2012-2015, with a financial support of USAID and Irish Aid. PCI is a premier organization in private sector development, with major functions of providing advisory services on Strategy, Finance and Development. ESAI is the first of its kind project in Ethiopia on business incubation. It has aimed at encouraging and stimulating the creation of new business to augment the key weakness of the selected value chains. Dairy, Honey/Wax, and Sesame are the three selected commodities on which the ESAI project was working. This was an action research project. Data was carefully collected based on clearly set objective and learning and reflections were made following the major milestones; while the project was also interested to meet some development goals, including fixing value chain problems through creating companies/businesses, creating new jobs and improving incomes of smallholder farmers and other value chain players. The project had diverse activities and involved in complex engagements. It is therefore very difficult to present all actions and learning's in short articles like this. However a case study approach was considered to focus on a selected case that can provide insight in to the theoretical framework used in this article, the Agricultural Innovation System.

The Dairy subsector was chosen as a case because the set of actors in this subsector is increasingly getting complex while the system performance does not commensurate with potentials. Interventions based on innovation systems perspective are believed to show good impacts to transform the sub sector. This case therefore helps to describe the rigorous processes the project went through in the course of innovation facilitation and learning. The key methods and approaches involved to facilitate dairy innovation in Ethiopia are described below.

**2.1 Deeper study of the value chain:** This was done through organizing a team of specialists in business, economics, strategy development, marketing and Agriculture/Dairy. Experts were drawn from national and international sources and the



key mission was to understand the system in out. Both quantitative and qualitative data were collected on economic issues like status of dairy production in the smallholder and commercial settings, product details, supply chain (input provision, quality control, service for producers, milk collection, transportation and deliver of products), Processing details (number of processors, product diversity, packaging, technology, skills), market details (supply, demand, distribution), cost structures of major products, major players, policy issues, dairy related institutions, business environment (the regulatory dimension), international markets and business experiences of other countries in dairy and so on. These presented a complete understanding of the dairy value chain and the final document was issued after being reviewed by key value chain players and researchers in the area. It was then made public on the Precise website ([www.preciseethiopia.com](http://www.preciseethiopia.com)).

**2.2 Defining the Leverage points:** The project was interested in bringing business solutions to value chain problems. It was therefore critical to identify the leverage points of the value chain. Leverage points here refers to important areas in the value chain where small changes made in to it could bring economically and socially significant changes in the entire system. For this to happen the following areas were selected.

- Quality and affordable Feed
- Genetic improvement through Artificial Insemination or other means
- Stimulating demand in the dairy sector
- Extended Shelf Life Dairy Products
- Stimulating a commercial Heifer Market

**2.3 Selection of entrepreneurs for the incubator:** This was again another critical approach, which determined the success of the project. Picking the right entrepreneurs who could make transformative changes in the system is not easy. It is even more challenging in countries like Ethiopia where the history of donor money created lots of dependence. People who are better informed and with good connections to decision makers often take advantages while the entrepreneurs who have the right attitude,

skills and energy may not get the chance. Therefore the project went through a rigorous process to minimize the risk. The right target group were selected through making a transparent announcement, conducting a merit based selection, providing training to the candidates on business plan preparation, organizing a panel of experts to hear the business plans of candidates, triangulating the selections made through asking opinions from board members, conducting due diligence and observing the behavior and commitment of the candidates during the long process of finalizing the selection.

#### **2.4 Establishing a subsector board**

Representatives of government officials, experienced entrepreneurs in dairy, experts and researchers constituted the board. The main function of the board was to provide strategic guidance, ensure transparency and serve as a sounding board when the project management was passing important decisions. At a later stage, the project secured funds to stimulate the dairy innovation. With additions of some people including donors and higher government bodies; the board continued to be responsible to oversee administration of the fund.

#### **2.5 Running the incubator**

This is a key function of the project. The business incubator is an institutional set up to nurture new business in selected value chains through providing services on business model innovation, development of bankable business plans, facilitating access to finance, markets and technologies, facilitating training on selected topics, encouraging intra-business linkages, encouraging sharing of knowledge and information between the companies, supporting companies to become more visible in the market. Unlike to the common technological incubation centers, which are typically furnished with workshops and machines', the agribusiness incubation center is a virtual center, which takes place in the real world situation of the entrepreneurs. The team members of the incubator were rather involved in intensive and frequent field visits to the working places of the incubatees. However the office of PCI was also used as a meeting avenue for information sharing and consultation. Before entering in to the incubation services all selected companies had to singe agreement with the incubator and incubation plans

had to be developed to specify the tasks expected from the company and from the incubator. In addition to the regular services of the incubator, the staffs involve in handholding services to help start-up companies get their business license, investment license, access to lands and leased offices, make arrangements with suppliers and buyers etc. This was in fact a time consuming and difficult task, but also made a significant contribution to the success of the incubator at higher level the leaders, of the incubator also involve in advocacy activities, facilitating learning, project management and attracting finance to the incubator.

## **2.6 Financing the Value Chain**

Facilitating access to finance is the most challenging task of incubator in places like Ethiopia, where there is no easy way for start-up companies. The incubator was in principle encouraging the entrepreneurs to self-finance their business projects. However several approaches were also used to explore financial resources for the incubatees. These include organizing agribusiness investment forum- where business to business meetings were facilitated and new investors showed interest to put money in some of the start-up companies; organize meetings with banks and equipment leasing companies, facilitate equity investment, facilitate crowd financing, supporting the business companies win call for proposals announced by NGOs and government affiliated projects. The most critical financial input for the dairy companies was however obtained from the Dairy Innovation Fund, which was generously injected by Irish Aid through USAID. The Dairy Innovation Fund was instrumental to support 15 innovative business in the first round and this paper will pay more attention to these business and the extent these business impact the entire value chain.

## **2.7 Training and Learning**

Innovation could take place faster and better when there is a conscious intervention on brokering knowledge and information for the businesses. In this project trainings were planned based on the needs of the companies and trainers were often pulled not from the academic circles but from people who are already in the business. For example, training on standards and quality, export business, tax administration, financial

management and so on were all done by people who are heading government service providing departments/institutions in similar areas. During the project period more than 10 training sessions were organized and all were designed to tap knowledge from the trainers but also to exchange knowledge and information from each other. Several important business linkages were facilitated among the companies during the training sessions. The companies have also established important linkages with the trainers who are able to provide them supports while running their businesses.

### **3. Background to the dairy sub sector in Ethiopia**

Dairy is a very important aspect of the local economy in Ethiopia however Ethiopia's Dairy sub sector still remains at infant stage of development. Out of Ethiopia's large cattle population of 35 million, 10 million are milking cows. Virtually all are of indigenous breed hence genetically poor in milk production yielding 1-2 litres of milk per cow per day. In addition, the traditional nature of the cattle rearing system in Ethiopia is non-market oriented where most of the milk produced is retained for home consumption. In some places like the pastoral areas, milk is produced more than the domestic consumption demand of the local people, and thus get spoiled or abused. Furthermore, the perishable nature of the dairy product and poor marketing infrastructure for milk are identified as the major impediments for the development of the dairy industry. Therefore, Ethiopia is a net importing country for commodities such as milk powder, cheese, butter, cream and UHT milk. Consequently, the milk consumption in the country has remained very low due to the undersupply and high price of dairy products. According to some studies, Ethiopia's Per Capita Milk Consumption disproportionately lags behind its neighboring countries with a mere 20 liters while Kenya, Uganda and Sudan's rate is 100 and 50 and 180 respectively.

Nevertheless, Ethiopia's Dairy sector has ample of potential for becoming the leading industry in the country. With a population over 50 million cattle, Ethiopia ranks number one cattle breeding country in Africa. With the annual milk production of 4 billion liters per year makes the country the fourth largest milk producer country in Eastern Africa.

In addition, the country enjoys diverse topographic and climatic conditions favorable for dairying. The favorable climate throughout the country has the potential to support the use of improved, high-yielding animal breeds and offers a relatively disease-free environment for livestock development.

To this end, USAID's Ethiopia Sustainable Agribusiness Incubator (ESAI) project was established to contribute in the transformation of the dairy sub sector by targeting the above mentioned bottlenecks in the dairy industry. It is generally setup with an instrument to improve farmer to market linkage, enhance the role of the private sector in value addition and increased investment in three subsectors one of which is the dairy sector.

#### **4. Dairy Innovation Fund**

This is a matching fund, which meant that the recipient has to contribute 50% of his/her project cost. The total budget for the Dairy Innovation Fund was €400,000 and its ultimate goal was to facilitate dairy innovation through buying some important machines or covering critical costs such as advertisement, packaging, marketing, experts etc. of the chosen companies. The fund's specific objectives are;

- To provide financial support to *innovative businesses models focusing on value addition* in the dairy sub-sector, hence enhancing the impact of the emerging businesses.
- To provide financial support for the development of *innovative dairy technologies* with great potential of commercialization and leading to a bigger impact in the sub-sector.

Comprehensive criteria and selection process was established to select the most innovative business models that are anticipated to positively impact the dairy subsector and contribute to its transformation.

## 5. Grantee Selection

It was paramount that innovative business were selected on transparent competitive processes based on their merits potential in creating significant impacts to the dairy subsector transformation. Therefore Project Selection Team ensured that following procedures were adhered.

A concept note competition was formally launched through News Paper **Advertising**, **various** websites etc. Information session was organized to explain the process and the contents expected in the concept note.

### **Eligibility Criteria**

To be eligible for the Dairy Innovation Fund, business concepts must satisfy the following criteria:

**Table 1 – Eligibility Criteria for Dairy Innovation Fund**

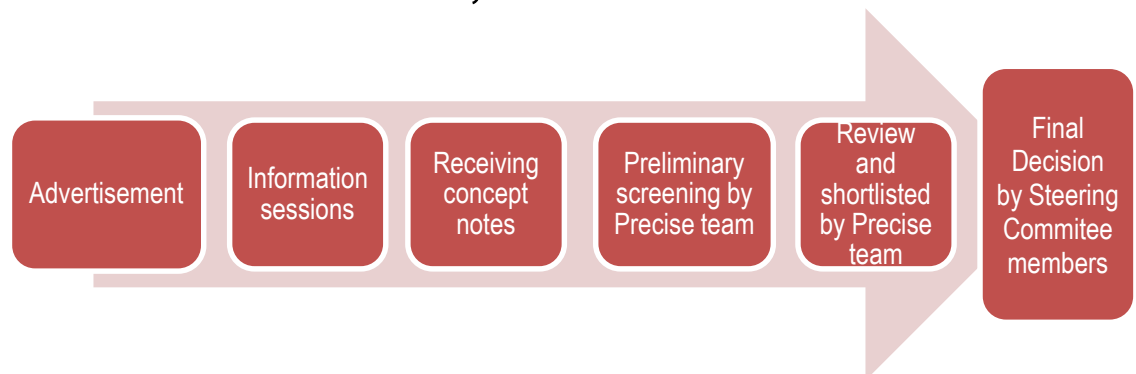
ELIGIBILITY CRITERIA
A. Clear link with the dairy subsector
B. 1:1 Matching funds
C. Innovativeness (50 points)
D. Job creation potential (15 Points)
E. Impact on Value Chain/Sub-sector (15 points)
F. Inclusiveness of youth and women entrepreneurs (10)
G. Social Inclusiveness and Contribution to a Green Economy (10 points)

Business models, which do not meet criteria A and B, were automatically rejected, since these are basic ones to meet the objectives of the project. The grantee's contribution may be met through own assets, (cash, machineries, raw materials etc.), co-funding (funding from financial institutions) or combination of the two. The business models that met the preliminary requirement were then assessed on criteria C-G using point systems as outlined above.

### **Screening Process**

Initially 58 Concept Note Applications were submitted. A multi-stage screening process was employed:

- STAGE 1.** This is a quicker screening stage done by the project management to identify those applicants who are able to meet or not the first two critical criteria.
- STAGE 2.** Concept notes, which pass the preliminary screening went through a point based assessment on innovativeness and other eligibility criteria outlined above. Project Assessment Team carried out this process and scores were allocated to the concept notes from which short list of applicants were made. Project management was then notified of the short list.
- STAGE 3.** The selected number of concept notes were then requested to submit a full business plan and present their project. Project Assessment Team will carried further evaluation and further short list of applicants were made. Project management was notified of the short list.
- STAGE 4.** Further due diligence assessments were carried out to identify potential issues of the business project (financial, legal, market, etc.). This was done by the project assessment team, which reported the finalists to the management.
- STAGE 5.** Members of the project management reviewed the business models short-listed. The sub sector advisory board made final selections.



**Figure 2. Selection Process through Launching Business Concept Note Competition**

Finally, with the approval of the Dairy advisory board, the following projects have been selected as innovative business models to be awarded DIF matching grant.

**Table 2. List of winner companies and types of business**

No	Name of Entrepreneur	Name of Organization Location	Business type
1	Fetlework Teferri	Brundo International plc; Mojo, Oromia	Spiced butter export business through entering partnership with organized 3000 rural women in three woredas
2	Dukale Lamisso	Dukale Lamisso Dairy production and milk processing private business; Hawassa, SNNPR	Animal feed processing using cheaper agri- byproducts and commercial forage seed /planting materials production business
3	Getachew Worku,	Hiwot Dairy Farm; Addis Ababa	Mechanical milking machine
4	Hirut Alemayehu	Hirut Dairy Products Distribution business, Addis Ababa	Distribution of milk/milk products through opening new shops in strategic locations of Addis in partnership with small and micro enterprises
5	Kedir Yimam	Lina Farms; Kombolcha, Amhara	Commercializing Silage
6	Merin Mengesha Erdaw	Eco Feed; Addis Ababa	Feed products using vegetable and fruit wastes as a main ingredient
7	Alemayehu Assaye	NASEBA Animal Nutrition	A creative formulation of calcium supplement to Animal feeds
8	Beruk Yemane	Ethio-Feed PLC, Adama, Oromia	Innovative feed solutions- Total Mixed Ration with EM products in a block form
9	Dr. Debay Tadesse	Debay Tadesse Farms, Chancho, Oromia	Improving the supply chain through collection of milk using cold tanks and cold trucks for the first time in the country
10	Binyam Kassa	Lactal Creamery, Assela, Oromia	Dairy Business Hub: a check off system through providing feed, AI and Veterinary services and collecting milk in return (not cash)
11	Bruck Sewnet	Bruck Sewnet, Addis Ababa Oromia	Improving the supply chain through collection of milk using cold tanks and cold trucks for the first time in the country
12	Dr. Edget Tilahun	Edget Business – Bishoftu, Oromia	Manufacturing of Rennet (enzyme for cheese making) for the first time in the country.
13	Tegegne Tarekegne	Tegegne and his family plc; Debre Birhan, Addis Ababa	Developing a Powder Milk Machine for the first time in the country



14	Zenebe Tesfaye	Zenebe Tesfaye ; Bahir Dar, Amhara region	Manufacturing of manual and smallholder farmer friendly butter churner
15	Zeratzion Woldelul	Sixty Eighty Engineering plc; Addis Ababa	Development of a prototype of a cold storage

## 6. Brief description of business projects supported by the Dairy Innovation fund

The project team and the advisory board has carefully selected business projects that can support the dairy value chain from five different dimensions. The business projects are organized here below in to five categories including *Animal feed, Dairy equipment and technology, Dairy Business Hub, Improving milk quality and supply chain and improving the distribution system of dairy products*. A brief description of the business in each category is presented next. Some insights to indicate the extent these interventions contribute to impact the vale chain is also discussed just by picking up one example from each category.

### **6.1 Category A - Animal Feed**

One of the fundamental bottlenecks in the dairy sub sector is limited livestock feed supply. Quality feed is vital for improving the growth, production and reproduction performance of livestock. However many technical and non-technical constraints persist leading to low productivity and value addition in the feed sector. Feed cost could account up to 70% of the total cost of producing a litter of milk. Consequently, such inflated cost of feed adversely affects the productivity and profitability of commercial livestock operations. Furthermore, inadequately fed animals cannot express their genetic potential for production and reproduction and become susceptible to a number of diseases and parasites.

To this end, a high proportion of projects selected for DIF fall in the Feed category.

- **Merin Mengesha;** This business is interested in the production of high quality animal feed, using by-products of fruits and vegetables as main ingredient for the first time in Ethiopia. It aims at reducing feed cost to the users through formulating a ration from relatively cheaper sources. The feed project is not compromising quality to reduce costs but it goes through the required procedures to make sure the feed meets the minimum quality standards. This

was done in cooperation with Holleta research center where they have a professional and competent animal feed laboratory. It has also tremendous contribution to environmental health since vegetable and fruit wastes are spoiling the city

- **Alemayehu Assaye Kassa-** This business project is about manufacturing of fortified calcium supplements to animals at industrial level. Calcium is a critical mineral, which is often deficient in the common animal feeds, including in the formulated rations from feed industries. Dairy animals are often manifest a symptom of hypocalcaemia (deficiency of calcium in the animal system) right after delivery and beginning of milk production. The new born calf and the process of manufacturing milk by the animal system demands high quantity of calcium and if this is not augmented timely, the chance of contracting this fatal disease by the dairy cow is very high. The cost of treating the animal using modern medicines is very expensive and a preventive measure is the best remedy to minimize risks. Alemayehu, who is also a DVM by profession, own a patent right for his creative formulation of fortified calcium and this project assisted him to grow bigger and scale up this innovation. He was motivated to innovate the new formula after observing a cow in his neighbor, which was about to die due to hypocalcaemia, and the owner (small holder farmer) was forced to pay more than a thousand birr to get a treatment.
- **Kedir Yimam** – Introduction of commercial silage production for the first time in Ethiopia. Silage is a type of animal feed prepared from maize and other fibrous grass species (while it is green and young) through creating anaerobic environment to facilitate bacterial fermentation. The fermentation process helps to conserve the green stuff. The feed could be used during the dry season without losing its greenness and quality. Some commercial dairy farmers prepare silage but it has never been available in the market in small pieces. Kedir, a young specialist in education, often supports his father in Kombolcha area who is maize farmer. Having observed the critical feed shortage of dairy farmers during the dry season in Kombolcha, Kedir has experimented a silage

production, which could easily enter in to the market. With the help of this project, Kedir is therefore the first entrepreneur who innovates a way of taking silages to the market. Plastic silos are used to prepare the silage and the nutritive quality of the silage was tested and proved to be superior by Holleta research center

- **Beruk Yemane** - Introduction of feed activated by Effective Micro-organisms (EM) at a commercial scale for the first time. EM is added in to a total mixed ration, which combines both roughage and concentrate feeds in to one whole. EM is a Japanese technology, which includes a group of beneficial bacteria (Rhizobium bacteria), which helps to improve digestibility of course animal feed and produces an aroma that attracts animals to improve their feed intake. This innovative feed is to be manufactured at larger scale using a block machine to be purchased with the assistance of this project. Biruk Yemane who is animal nutritionist by training and served the public and non-public organizations for many years, turned to be one of the leading entrepreneurs in Animal feed in the country. He has a firm stand that as a small company, his enterprises could survive the stiff market competition if he is involved in innovative feed solutions. For example, Biruk, in collaboration with Precise Consult International, and with a financial/machinery support of LMD (another USAID financed project) –has tested for the first time a franchise business model in animal feed, which uses cheap agricultural by product resources as a main ingredient. This was implemented in partnership with group of young people in Wonji Sugar factory (Oromia), with Lemlem Raya Cooperative Union in Mokoni (Tigray) and a private entrepreneur in Anno, Wollega (Oromia). The project is in good progress and it is likely to impact the dairy industry tremendously, upon starting to operate at a bigger scale.
- **Dukale Lammiso** - To set up forage seed production and marketing company using an out grower model. This project is set up in Hawassa for the first time. Dukale has partnered with a farmer who has many years of experience in forage seed production after getting professional training from ILRI. He has also entered

in to a creative business partnership with farmers around Hawassa who are willing to provide 11 ha of land for forage seed production. The farmers will be employed as laborers by the enterprise but they will have also 50% profit share from the business. Many more farmers are showing interest to join this innovative business model, but Dukale preferred to see the outcomes of the first 11 ha of land and scale it up slowly. As a complementary enterprise Dukale has also established a feed processing plant using maize stalk, maize cobs and other agricultural by products, such as coffee hulls, which are cheaply available in the area. He is strongly linked with Hawassa University and he is at the moment enjoying knowledge inputs from the university on creative formulation of animal feeds.

**An example of impacts in the value chain**

**Entrepreneur** - Merine Megesha (Eco-Feed)

**Project Name:** Eco Feed

Eco feed is expected to produce quality feed at 40% to 60% lower selling price than the conventional feed. The business has already started operation and it is expected to become fully operational after receiving the second millstone fund from the project. The reduced cost of feed is expected to encourage increasing number of dairy farms to join the industry, apparently milk processors will be in a better position to access raw milk for their industries.

Merin has organized youths into Small and Micro Enterprise groups to collect the by-Products required in his Eco-Feed project. The project will create up to 300 jobs in the next three years.

The use of byproducts of fruits and vegetables will have also tremendous impacts to reduce environmental pollution created by the depletion of fruits and vegetables.

The feed product has been officially analyzed by Holleta Agriculture Research Center and the result show that Eco-Feed product meets the minimum quality standards for formulated ration.

**6.2 Category B - Dairy Equipment and Technology**

Locally available quality dairy equipment and technology is limited in Ethiopia.

Virtually all large-scale dairy processing machineries are imported and are very expensive. Promoting locally produced technology and the modernization of the dairy sub-sector is one of the intervention areas that is vital in the transformation of the

dairy sub sector, by reducing wastage, improve quality of milk and encourages and contributes to product diversification.

Therefore, a number of technologists have been selected for Dairy Innovative Fund to support leverage the risk associated with introducing new ideas into the market which are outlined below.

- **Getachew Worku** – Introducing milking machine entirely operated by mechanical force (Machine adapted from India with modification). This machine is supposed to prevent farmers from having a direct contact with the milk coming down from the cow and this is likely to increase the milk quality because the chance of the milk that will be subjected to contamination will be lower. The machine also helps to minimize the risk of mastitis, which is an infection of the teats often caused by the scratches made by inexperienced and impatient people conducting hand milking. In the dairy industry, one of the serious complaints coming from the processing plants is lack of good quality milk from the smallholder farmers. Some entrepreneurs are even mentioning this as a reason not to start powder and UHT milk which requires high quality milk supply. Getachew Worku is an animal science expert by training who also owns a dairy farm in Addis. He has served at senior positions in the government and non-government offices and he is always keen to see the dairy industry modernized. He has now partnered with technologies that will be able to manufacture the prototype under his guidance. The equipment will be tested in his farm, in Holleta research center and finally in a field day, in collaboration with Sululta Dairy Union, to demonstrate the technology to the public. The feedbacks to be gathered in each episode will be used to improve the equipment - before going in to a bulk production.
- **Zenebe Tesfaye** - Manufacturing of a low cost, user-friendly mechanical churner at industrial scale. Among the diverse dairy products, spiced butter is one of the most popular item used in the day-to-day food preparation of Ethiopian families, especially in the urban settlements. It is in fact a good idea to consider the consumption of butter as part of per capita milk consumption calculation, in

Ethiopia which is often undervalued, because the liquid milk is only assumed in the computation. Butter includes almost all solid components of the milk, and water, which makes more than 85% of the whole milk, is the only missing one. Women are used to churn butter using traditional equipment. For an average woman in the rural areas, it takes 4-5 hrs to churn half a kilo of butter out of 10 liters of milk. Zenebe Tesfaye, technologies based in Bahir Dar came up with a mechanical milk churning prototype which has a capacity to process 10 liters of milk in 30 minutes. The project has agreed to provide a matching grant to Zenebe Tesfaye but agreement has also been reached with him that the first milestone will be to finance the manufacturing of a couple of equipment which will be tested by farmers/women in Baherdar, in the presence of experts from university, research, extension organizations and relevant NGOs. The technologist will then incorporate the comments to make the final equipment. A small group of experts will be invited to see the final product before it is allowed to proceed for mass production using the matching grant from the project.

- **Zeratzion Woldelul** – Manufacturing and supply of cold stores for milk producers, collectors and processors. This technology is almost missing in the dairy industry while it is very critical to improve milk quality, through getting it cooler right after milking and before delivering it to the processing industries or raw milk users. This is a critical time that contributes to multiplication of bacteria if the milk is handled in warmer climate, even at room temperature. Under normal condition the milk handled by the smallholder farmers is always subjected to high risk of contamination. Warmer temperature accelerates faster multiplication of bacteria, which eventually increase the alcohol content of the milk. Milk with higher alcohol content than the scientifically suggested range is always subject for rejection by industrial buyers. Zeratzion Woldelul, an energy engineer by training, who is also a manufacturer and entrepreneur of office and laboratory equipment showed interest to design a prototype for a cold room. He

is supported to develop the cold room and get it tested by the competent government agency before going in to a bulk production.

- **Tegegne Tarekegn** - Manufacturing of a powder milk machine (the first of its kind in the country), that meets the standards set by the relevant government authorities. Powder milk is being imported from abroad and there is no single company trying to set up a powder milk processing industry in Ethiopia yet. Tegegne is a technologist who has been in the business of manufacturing incubators for the poultry industry (a pioneer in incubator manufacturing) and other machineries to the manufacturing and construction industries. Overtime he developed interest to make a prototype for a powered milk production, without getting any support from anybody. He was given a patent right for his creativity in the design of the powder milk by the Ministry of Science and Technology but he has never been able to enter to the market because of several obstacles. Tegenge has already tried producing the powder milk using his prototype and the laboratory test result from the pastor institute was very encouraging. Tegenge, after becoming part of the incubator was assisted to get a land in Debreberhan city and his business plan was prepared, reviewed and finalized with the assistance of the incubator staff. He is now in a position to manufacture the prototype with much bigger capacity than the previous one and the process of manufacturing is planned to be supported by the Technology Institute of Addis Ababa University and the standard authority of the government.

#### **An example of impact in the value chain**

**Entrepreneur** - Tegegne Tarekegn

**Project Name:** Production of Powder Milk Machine

**Business Model:** Manufacturing of a powder milk machine (the first of its kind in the country), that meets the standards set by the relevant government authorities. Farmers have very little chances to sell their milk during the fasting seasons because there is not enough technology in the country to change the perishable product (milk) in to a long shelf life product (powder milk, UHT milk). Therefore, the project is expected to address the seasonal mismatch of supply and demand of dairy products. The higher the powder milk processors are joining the dairy industry, the more people will be likely to start dairying as a regular business both in the urban and rural settings.

For example, one of the reasons why smallholder farmers are refrained from having improved dairy breeds and using highly nutritious feedstuff to maximize production is the milk market fluctuation. Many farmers will be encouraged to reorient their business to dairy farming the moment they know milk market is secured. Distribution of milk powder in the entire country could also open another lucrative business window for new and existing entrepreneurs. Eventually, the per capita milk consumption in Ethiopia will show high increment. This technology has therefore tremendous power to move the supply chain, the processing industry and the market in one go. In addition this project will also improve import substitution for machinery and powder milk.

### **6.3 Category C- Dairy Business Hub**

Inaccessibility of farm inputs for dairy farmers including quality feed in good quantity, animal health service delivery system and Artificial Insemination services are major challenges in the dairy sector. The government introduced these services in different ways but the success rate is not so great. The private sector has not yet taken over at full scale. Private sector led Dairy Business Hub Model is new to Ethiopia and it is expected to increase the role of private sector in providing input services as well as improve the supply chain because the relationship between the producers and services providers, who are also involved in value addition activities, will be strong. Such interventions will enable farmers' get the farm inputs on credit basis using check-off system, (get the service now and pay later in kind). This will enable the resource-poor farmers afford the inputs of dairy production, thus making this farm enterprise feasible for them. In this business mode only one company showed interest and this case and the possible impact trends are given below.

#### **An example of impact in the value chain**

**Entrepreneur** - Binyam Kassa

**Project Name:** Establishment of a Dairy Business Hub and Milk Processing

**Business Model** - Introduction of Dairy Business Hub is a lesson drawn from a successful case in Kenya. Including the provision of feed, AI and Vet drugs on credit basis to smallholder dairy producers in Arsi zone and collects milk in a check-off system. Lactal Creamery will coordinate farm input suppliers to provide the service in a 'one-window' service at milk collection centers already established by primary dairy cooperatives that formed the Arsi Dairy Coops Union. Provision of feed, AI and Vet drugs on credit basis to 300 smallholder dairy producers in Arsi zone and collects milk in a check-off system. Overall, by making input services easily available to farmers the project will contribute in improve the genetic potential of dairy animals, prevent life-threatening cattle



diseases that hinder the sector significantly, increase productivity as a result of high quality feed..

54 employees will be hired in distribution of feed, AI service and vet at 10 selected milk collection centers (hubs).

The project will create 31 employment opportunities in the processing plant when it reaches full capacity

#### **6.4 Category D - Improving milk quality and supply chain using Chilling Facility**

The use of refrigerated storage and transport facility for milk and milk product is virtually unused. Such practices compromise the quality of milk and increases wastage.

Introduction of modernized and milk collection and delivery system using chilling facilities with quality control system will improve the availability of quality milk in the market hence contribute in the transformation of the dairy sector.

Therefore, two projects have been selected for Dairy Innovative Fund in this category, which are;

- Bruck Sewnet; Milk Collection and Distribution using chilling facilities in collaboration with Abdi Boru Community Development Initiative (ABCoDI)
- Dr. Tadesse Debay and Mrs. Georgia- Ann - Milk Collection and Distribution in using chilling facilities in the Chancho area.

Both companies use more or less the same business model. The case of Bruck Sewnet might help to provide good insight about the business model.

#### **An example of impact in the value chain**

**Entrepreneur** – Bruck Sewnet

**Project Name:** Milk Collection and Distribution

**Business Model** – The project will collaborate with Abdi Boru Community Development Initiative (ABCoDI) that manages 25 kebeles for supply of milk from smallholder farmers in Berek and Alletu woredas, Sendafa. The project aims to improve the quality of milk and milk byproducts (Milk collected in the evening will stored in cold tankers –reducing spoilage.)

The projects' major input is a milk storage tank and cold trucks (refrigerated trucks). This is going to be tried for the first time in the dairy industry, and its impact will be mainly in improving milk quality and delivery efficiency. The cold tanks will be equipped with milk quality control equipment and a motorized facility will be used to pump the milk from the cold tanks to the cold trucks. Traditionally milk collected by smallholder farmers during the evening is just kept under room temperature over night and farmers are used to remove the coagulated fat from the top of the milk layer in the next morning and mix the rest of the milk with a freshly collected milk in the morning. This tradition contributes to high rate of milk spoilage because the milk from the preceding day happens to be a medium of bacterial multiplication, unless it is kept under very high hygienic standard and 4 degree centigrade room temperature. These two conditions are unlikely to be met in the settings of the smallholder farmers. Therefore the

installation of the cold tank in the village will encourage farmers to sell the milk from evening milking, apparently the chance of the milk to remain safe and hygienic will be higher. The project will encourage processors to introduce similar collection and delivery system using cooling facilities. This will ultimately improve linkage between demand and supply and most importantly it will encourage entrepreneurs who would like to start a milk powder and UHT milk, which essentially requires high quality milk.

#### ***6.5 Category Dairy E - Products Distribution System***

Inconsistent availability and market for processed dairy products is another major bottleneck in the dairy sub sector. Strategic and professionally designed distribution system for dairy products is highly essential in the improvement of the dairy industry. Improving the distribution system is not only helpful, to increase access for those who were regular consumers of milk and other dairy products but also to stimulate new demands among the group of people who might have not been users of dairy products before, without having good reasons. When milk shops of good hygienic standards are available in strategic locations, many people will be tempted to buy some products. There was one company in the list of the grantees, which was interested in such business model and it happens to be the first of its kind in Ethiopia. A brief description of the company is given below.

#### **An example of impact in the value chain**

**Entrepreneur** - Hirut Alemayehu

**Project Name** - Dairy Retail Chain Development

**Business Model** - To set up Dairy Kiosks in condominium areas and other strategic locations to strengthen forward linkages for dairy processors.

The project is expected to stimulate milk consumption by reducing transaction costs and improving access to dairy products for consumers. It will address the missing link in the value chain, dedicating efforts and resources to linking processors with end consumers. The project will partner with small and micro enterprises bureau of the Addis Ababa administration and the management bodies of the selected condominium sites in Addis. The Addis Ababa Administration bureau for small and micro enterprises will be responsible to organize the groups by paying emphasis to women candidates and those who had relatively good entrepreneurial attitude and skills. The bureau agreed to provide a workstation /shops for the associations and Hirut is responsible to deliver all kinds of dairy products at good price. Again she will also supply refrigerators, shelves and other equipment to those who have shops. On the other hand, Hirut will use the grant money to build small and attractive shops in the premises of the condominiums, which the space will be provided by the condominium administration for free. Young people who are residents of the respective condominium and organized in to groups will get priority to work in the shops. The value distribution between Hirut and the associations is worked out carefully to make sure all value chain players are happy

in terms of making enough profits. Hirut has also entered partnership agreement with the processors to make sure that there will be a sustainable supplies of dairy products both during the fasting and non-fasting seasons. She also has used similar norms and conditions to singe agreement with the distribution shops/associations. So far about 10 locations are identified and all the administrative works in terms of registering the associations, securing shops and signing agreements with Hirut is done. Upon the release of the first millstone funds, Hirut will immediately start the business. This model is a scalable one and it is highly likely to see similar business coming up by other distribution companies in Addis and outside Addis. This intervention is believed to be instrumental to increase the per capita milk consumption of Ethiopians, and the health status of children and adults will be improved.

## **7. The pillars of the innovation model**

The building blokes of the ESAI project are described here below. Theses refer to the most important functions, which determined the success of the project. These could also be considered as a framework to facilitate innovation in agribusiness incubator projects in Agriculture.

**7.1 Understanding the value chain:** The approach discussed in this paper could be applied to facilitate agricultural innovation in any sub sector. The most important and a kick of activity is to study the value chain in and out. Both the economics, institutional, policy and technical issues of the selected commodities need to be addressed with good details, and with emphasis to finding the entry/leverage points that could help to achieve transformative interventions. Before launching such a study a multi-disciplinary team is required. A combination of qualified professionals in the field of Economics, Business, Finance and Agriculture is highly required. Most importantly the team need to have a private sector development perspective and good insight of the agricultural innovation system framework.

**7.2 Flexible Management:** Innovation is about the ability of using talents and skills to make sense from messy and less predictable socio-economic conditions, which is often typical in booming economies like the one we have in Ethiopia. Flexible management is therefore very critical to grab newly popping up opportunities, as well as to drop initiatives without spending more time and resources, when they appear to be less promising to succeed. This kind of management works well under the private

sector set up where right decisions can be taken when ever needed, without entering in to a long bureaucratic procedures .The nature of incubator project (ESAI) allowed the project team to act accordingly and this was one of the key pillars of the project.

**7.3 Selecting the right target group** –implementing a rigorous selection process has enabled ESAI to select right entrepreneurs with the right level of dedication and financial commitment. Such process has contributed in promoting entrepreneurship and increasing role of private sector in transforming the dairy sector reducing the reliance on donor led development.

**7.4 Developing innovative business models:** Business model innovation is one of the key knowledge inputs of this project, which contributed a lot to the success of this initiative. At first, the entrepreneurs usually come to ESAI with vague but also promising business ideas. The support of the PCI staffs finally leads the entrepreneurs to have a workable and innovative business models. This was not a daylong assignment for the staff, but several meetings had to take place among the ESAI staff and the entrepreneurs.

**7.5 Access to finance:** This project was designed to provide only technical assistance to the companies enrolled in the incubator. The staffs of the incubator therefor spent several sleepless nights to make sure everybody in the incubator has enough access to finance. In principle majority of the investment cost was born by the entrepreneurs, but that was not enough to help them start the business. The project had to work hard and secure resources from some institutions, notably: Banks, Donors and Equity investors. The most helpful financial resource for the dairy subsector has actually came from the Dairy Innovation fund, which was accessed from Irish Aid. It was instrumental to intentionally focus on the key challenges of the dairy value chains. The level of control of the project over the other sources of finance was very little and the project has been forced to alter some of its approaches to meet the critical financial challenges of the value chain.

**7.6 Knowledge and information:** The training programs designed and implemented during the project period were source of important information and knowledge for the entrepreneurs. The entrepreneurs had also free access to consult experts in PCI. The PCI staffs were very helpful in assisting the development of innovative business models and providing sub sector specific information (policy, regulatory and technical). Moreover, a systematic linkage was also facilitated with knowledge institutions such as research organizations and universities. Efforts have also been made to create a learning platform under the auspice of the Ministry of Science and Technology. This was intentionally designed to bring on board experts from standards authority and conformity assessment to support the development of new technologies described in the previous section. However, this effort did not succeed since this was not found to be a priority to the ministry of Science and Technology, although the project strongly believes that supporting technology developers and those who are trying to adapt new technologies from abroad is one of the mandate areas of the ministry.

## **8. Conclusion and Recommendations**

This project was a unique approach to facilitate innovation in the dairy subsector in Ethiopia. It was quite different from the dairy/agricultural development approaches of the state and many of the non-state actors in the country, which are mainly production focused. Successful innovation may not happen because we have a cutting age technologies, nor the market demand for the products is very high. It is rather a creative combination and interaction of the market players and scientific knowledge suppliers that could result a better innovation process and performance. The institutional culture in Ethiopia is however founded on the conventional Transfer of Technology Model, which provides little or no attention to the private sector actors, who are actually influential in the value chains. A shift in approach in to the new paradigm is therefore a necessary condition to make sure our agricultural services would remain relevant to the quickly changing context in Ethiopia as a result of the booming economy of the nation. On the other hand, although the value chain approaches are very important to deal with the changing contexts in Ethiopia, absence of enough incentives for the knowledge

institutions such as research and universities to work together with the value chain actors is an obvious gap. The agricultural innovation system approach discussed in this paper has rather the power to bring these two crucial clusters of actors to work together. However, in the case study discussed in this article, although the project staffs have made tremendous efforts to get the support of the Ministry of Science and Technology in this regard, the response was not satisfactory and it is very important for the relevant ministries to work for the development of the private sector in agribusiness. Finally, financing the value chain has been a critical challenge of the project. Depending on Banks and donor money is still a possibility, but the most sustainable approach could be when the bigger and economically powerful private sector actors are willing to finance the value chains. Ultimately this will help them to have a strongly established supply chain, which involves many players, in addition to the major actors, the producers.